

Acoustic Associates Sussex Ltd

Planning Condition Indoor Noise Survey

Site: 'Roseland', The Causeway, Arundel

Client: Birchside Management Ltd

Planning Reference: LY/25/17/PL

Report by: George Orton BEng(Hons) MIOA

Date: 14/12/2018

Project: J2327

Issue 3



Acoustic Associates

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Issue 1	03/09/2018	
Issue 1	23/11/2018	Extra Clarification regarding survey
Issue 3	03/09/2018	Report Addendum regarding acoustic and ventilation.

1 Introduction

Acoustic Associates have been appointed to undertake an acoustic assessment of the proposed 'Roseland', The Causeway, Arundel development.

The development has gained planning approval albeit with certain conditions which are discussed in section 4.

The development will demolish the existing buildings and build a new block of residential apartments in its place.

Transportation (road and rail) noise was initially measured, close to where the development will be built, prior to the existing building being demolished.

Noise mitigation measures have been recommended and implemented by the developer.

This report details the noise survey which was carried out inside the partially completed development.

The noise levels for the day and the night time period have been assessed in terms of BS8233 "2014" as discussed in the planning condition

The measurement results and assessment show that planning condition criteria, relating to noise, have been achieved.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

The proposed development will comprise of one block of flats (2 on ground floor, 2 on first floor and one second floor flat built into the roof)

All of the existing buildings will be demolished to make way for the new development. The development has gained planning approval, albeit with certain conditions.

The final survey of indoor noise levels has been completed as a result of the wording of planning condition 13 which has been copied below:

13: Before first occupation of any dwelling where unacceptably high levels of noise are likely to be experienced, then post validation testing shall be undertaken by a competent person to determine compliance with the acoustic report and BS8233. This must be submitted and agreed in writing with the Local Planning Authority before first occupation.

Note: After discussion with the local authority it was ascertained that "unacceptably high" would be the level of noise where leaving a window open would result in indoor levels in excess of the BS8233 internal noise level criteria.

2.2 Criteria

Based upon the wording of the condition it is recommended that criteria are provided by:

- BS8233 (Sound insulation and noise reduction for buildings) 2014

2.3 BS8233 Noise Criteria

Table 5 of BS8233 provides the following guideline values:

Activity	Location	Time period of day	
		07:00-23:00	23:00-07:00
Resting	Living Rooms	35dB L _{Aeq,16hour}	-
Dining	Dining Room/Area	40dB L _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35dB L _{Aeq,16hour}	30dB L _{Aeq,8hour}

Table 1: BS8233 Criteria

3 Initial Noise Survey

An unattended noise survey was carried out from the 29/09 to the 04/10 2017 in order to measure Road/Rail noise levels affecting the proposed development. The initial survey was used to specify mitigation measures which were completed by the developer.

3.1 Noise Survey Results

At this position the dominant noise source is the road. The survey data has been used to calculate the 16hr day time and the 8hr night time period noise levels:

Date 2017	Day	Freefield dBA	
		L _{Aeq} 07:00-23:00hrs	L _{Aeq} 23:00-07:00hrs
29/09	Friday	-	52.1
30/09	Saturday	57.3	52.3
01/10	Sunday	57.9	53.8
02/10	Monday	59.7	54.5
03/10	Tuesday	59.4	54.8
Average all		59	54
Average weekdays		60	55

Table 2: Unattended Noise Survey Levels

Additional measurements were also completed of noise created by the nearby railway.

3.2 Required Sound Insulation of Building Envelope

The survey data was used to create a noise model for the proposed development. The revised model (actual as built window positions)

The noise model predictions were then used to demonstrate minimum building envelope sound reduction (SRI) required so that the BS8233 criteria can be achieved. *For simplicity worst RPs have been used.*

Model Position	External Noise Level	ReqSRI
4 Bedroom Night	49	19
4 Bedroom Day	54	19
4 Living Day	60	25
5 (roof) Lounge	59	24
5 (roof) Bedroom	54	24

Table 3: Required SRI

4 Final Indoor Noise Survey Baseline Conditions and Results

4.1 Methodology

Measurements have been completed inside the part completed development to demonstrate that the BS8233 noise criteria have been achieved. The measurements were completed in unfurnished rooms whilst construction work (mainly external) was still being completed during the day and occasional evenings. The survey locations are detailed below and in a plan that can be found in the appendix. The measurements were completed with trickle vents open and windows closed.

4.2 Equipment

The following equipment was used to complete the measurements:

- 2x Castle "Mirus" Type 1 sound level meter

4.3 Site Conditions

All measurements were conducted inside the partially completed building. At the time of the survey the development was still being constructed and there was a large amount of activity which would have affected the daytime noise survey results.

The unattended measurements were completed in unfurnished rooms the two lounge rooms had a hard floor finish the bedroom had been carpeted.

4.4 Results Flat 4 Lounge

The model showed that Flat 4 (lounge) is exposed to the highest levels of external noise. The results of the survey can be found below:

Date	Date	Plot 4 Lounge	
		L _{Aeq} 2300-07:00	L _{Aeq} 07:00-23:00
10-Aug	Friday	27	
11-Aug	Saturday	25	33
12-Aug	Sunday	28	30
13-Aug	Monday	28	37
14-Aug	Tuesday	28	37
15-Aug	Wednesday	27	35
16-Aug	Thursday	28	43
17-Aug	Friday	27	64

Table 4: Survey Results 4 Lounge

4.5 Results Flat 4 Bedroom

A sound level meter was also installed in Flat 4's bedroom.

Unfortunately the night time noise levels were often below the 21dBA lowest range for the sound level meter.

Therefore every night time $L_{Aeq,8hr}$ noise level, when calculated from the 15minute consecutive measurements, was 22dBA (with one exception when building alarm went off during the night). The survey graph can be seen in the appendix and the day time results can be seen below:

Date	Date	Plot 4 Bedroom
		$L_{Aeq, 07:00-23:00}$
11-Aug	Saturday	25
12-Aug	Sunday	27
13-Aug	Monday	30
14-Aug	Tuesday	27
15-Aug	Wednesday	48
16-Aug	Thursday	31
17-Aug	Friday	37

Table 5: Survey Results 4 Bedroom

4.6 Results Flat 5 Lounge

Additional measurements were also completed after construction works finished on Monday the 20th August:

- $L_{Aeq,18:00-21:41Hrs} = 30dBA$

Date	Time	Plot 5 Lounge
		$L_{Aeq, 1Hr}$
11-Aug	18:00	31
12-Aug	19:00	31
13-Aug	20:00	29
14-Aug	21:00	29

Table 6: Plot 5 Measurements

5 Conclusion

Noise levels have been measured in several locations within the development. The survey locations are detailed below and in a plan that can be found in the appendix. The measurements were completed with trickle vents open and windows closed.

The measurements were completed in empty rooms which may mean that the recorded levels are higher than they will be when the rooms are furnished. As the criteria have been achieved at this stage no reverberation time corrections have been applied to predict the "finished furnished" noise levels.

The survey also had to be completed as early as possible in order so that the condition could be signed off before the building is occupied. This meant that the survey was conducted whilst the building site was still operational during the day. This is the reason why some of the day time results are higher than others.

A summary of noise levels can be found below:

- Plot 4 Lounge – no more than 33dBA during the daytime
On weekend days when only the painter was working during the mornings (Also see note below)
- Plot 4 Lounge – average of 27dBA during the night time
This was for all nights which should not have been affected by site operations. For the original survey the daytime noise level was 5dB higher than the night time. This means that the noise level during the day should be approximately 32dBA if measured with no site operations.
- Plot 4 Bedroom – less than 30dBA during the daytime on days when site activities were quieter.
- Plot 4 Bedroom – less than 22dBA during the night time
- Plot 5 Lounge – 30dBA during an evening measurement period.
This is approximately equal to the equivalent time period as measured in Flat 4 Lounge. Therefore the overall level in Flat 5 should be approximately 27dBA during the night time and 32dBA during the day.

The above levels achieve the criteria detailed in BS8233 and the planning condition which have been copied below:

- 07:00-23:00hrs noise level to be less than or equal to 35dBA
- 23:00-07:00hrs noise level to be less than or equal to 35dBA

As mentioned previously some of the day time readings may have been affected by building site noise. Measurements were also conducted in empty unfurnished rooms. Therefore the levels inside will likely be marginally lower when the development is finished and occupied.

Untested rooms on the front façade had the same glazing and ventilation arrangements as Flat 4 Lounge. Therefore noise levels in these rooms would be subject to lower internal noise levels as they are marginally less affected by noise and have smaller windows.

Untested rooms on the rear façade will have internal noise levels similar to as measured in the bedroom of Flat 4.

The above demonstrates that, in terms of acoustics, the planning condition has been satisfied.

6 Appendix

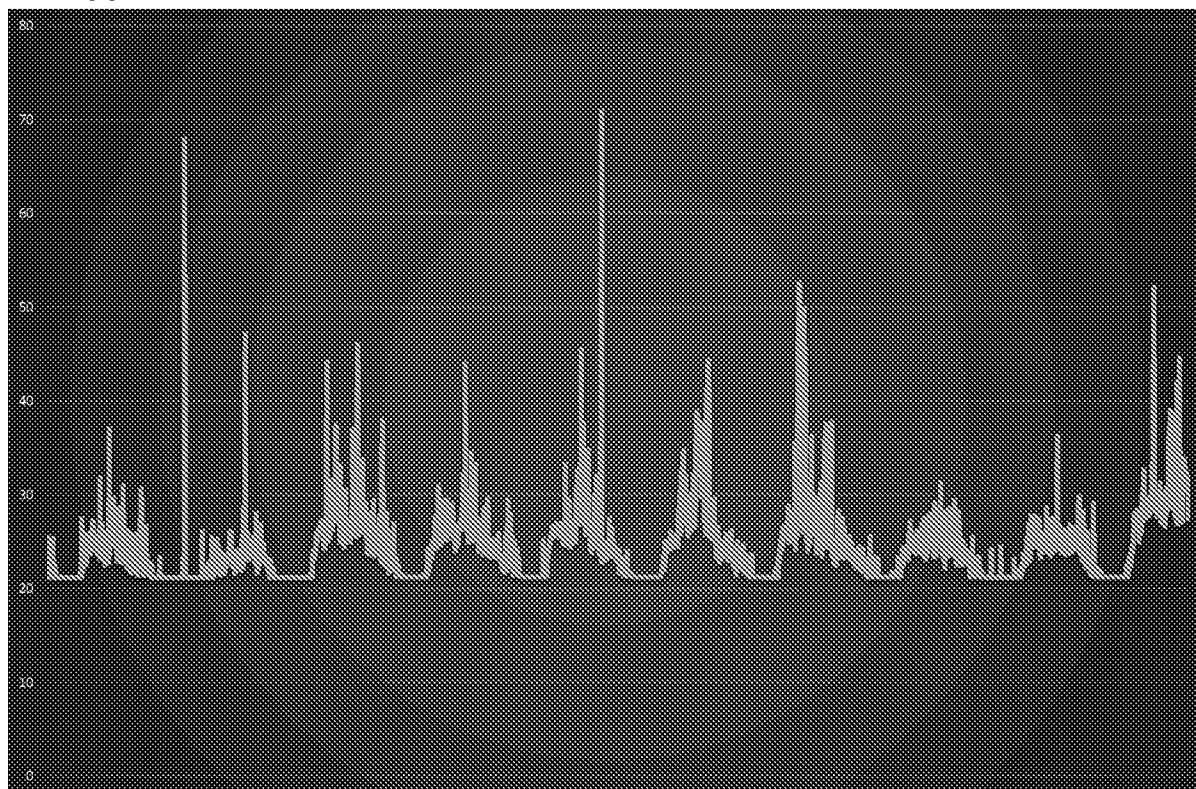


Figure 1: Plot 4 Bedroom Survey Graph

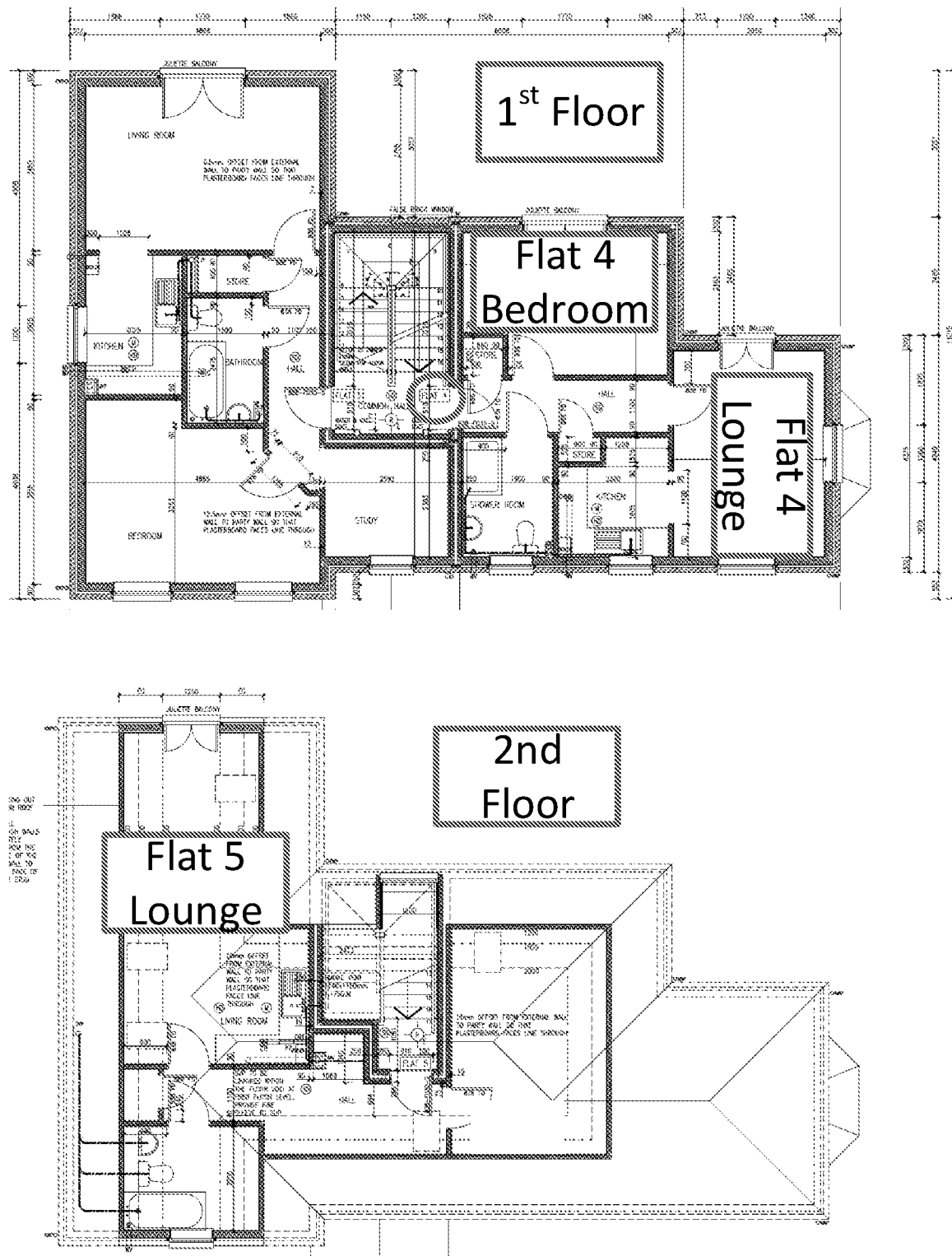


Figure 2: Indoor Survey Locations

7 Report Addendum

Following the completion of the final sound survey and report it is understood that the developer and Local Authority Planning Department held a discussion regarding the installed ventilation systems.

The developer has requested that Acoustics Associates complete a brief summary of acoustics points relating to the Roselands residential development.

Points where acoustics and ventilation have common ground have also been covered.

However it should be noted that Acoustic Associates did not carry out any design services relating to the ventilation system.

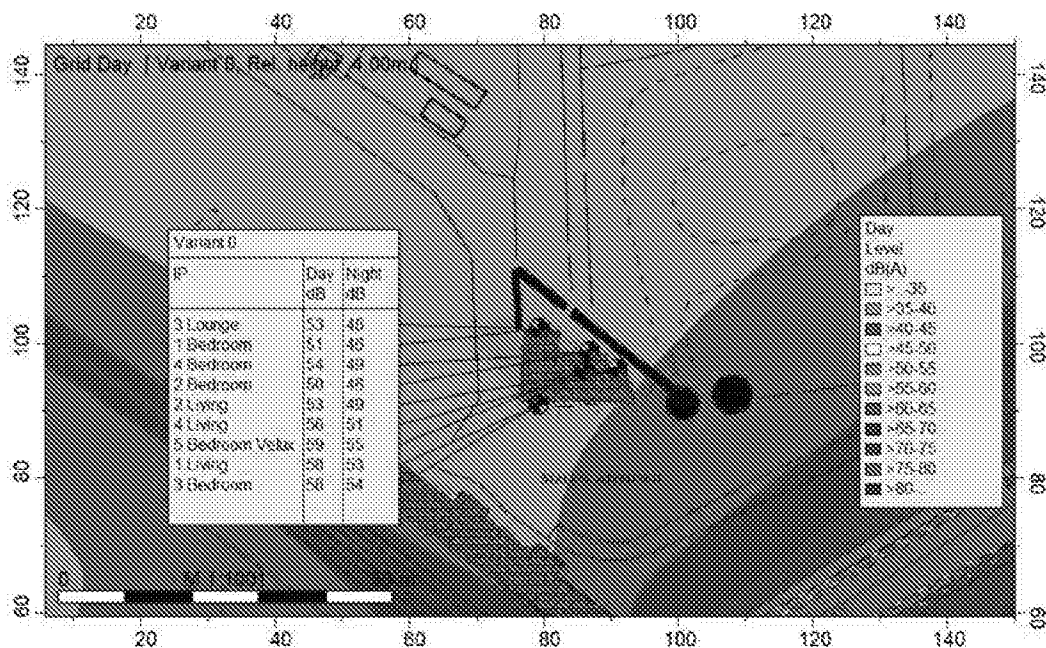
Input was given regarding the acoustic rating for glazing and trickle vents based on the number of windows and vents for each room. :

- It is understood that the developer has installed a ventilation system that requires that trickle vents are installed in windows.
- It is now confirmed that the system uses intermittent mechanical extract fans.
- Acoustic Associates stated the sound reduction for the ventilators based on the noise model data and based on the number of vents for each room.
- It is understood that the number of trickle vents was specified (and as I understand accepted by Building Control) to achieve the correct level of whole dwelling ventilation (often called background ventilation).
- The indoor noise survey showed that, with trickle vents open, the noise criteria in furnished flats will be achieved.
- It is understood that open windows would be required for purge ventilation. However this would also be the case with other ventilation systems as detailed in the extract below (taken from the ANCs Draft Acoustics, Ventilation and Overheating Guidance February 2018):

Table 2-2 ADF template Systems

Ventilation system	Provision with ADF system / purpose		
	Whole dwelling ventilation	Extract ventilation	Purge ventilation
System 1 – Background ventilators and intermittent extract fans	Background ventilators (Trickle vents)	Intermittent extract fans	Typically provided by opening windows
System 2 – Passive Stack ("natural")	Background ventilators (Trickle vents) and passive stack ventilation	Continuous via passive stack	Typically provided by opening windows
System 3: Continuous mechanical extract (MEV)	Continuous mechanical extract – minimum low rate Trickle vents provide inlet air	Continuous mechanical extract – minimum high rate Trickle vents provide inlet air	Typically provided by opening windows
System 4: Continuously mechanical supply and extract with heat recovery (MVHR)	Continuous mechanical supply and extract – minimum low rate	Continuous mechanical supply and extract – minimum high rate	Typically provided by opening windows

- The majority of rooms (except Flat 3 Bedroom) have a window position on the quieter West facing façade.
- The noise model has been altered to predict the noise level at the least affected window for each room:



- The above shows that (assuming internal noise level will be 15dB lower than external level if a window is open) the internal noise level with a window open for purge ventilation will be 1-10dB higher than the BS8233 criteria. However there is no criteria for internal noise levels during brief periods where purge ventilation is required as detailed in the Acoustics, Ventilation and Overheating Guidance:

Table 3-1 Indoor Ambient Noise Levels resulting from transport noise sources - ADF ventilation condition

Ventilation condition	Possible system or design solution	Desirable internal ambient noise level from transport noise sources
Part F - Whole dwelling ventilation	System 1: Intermittent extract fans with background ('trickle') ventilators ^(Note 1)	Guideline values from Table 4 of BS 8233:2014.
	System 2: Passive stack ventilators with background ('trickle') ventilators ^(Note 2)	
	System 3: Continuous mechanical extract with background ('trickle') ventilators ^(Note 2)	
	System 4: Continuous mechanical supply and extract with heat recovery (MVHR)	
Part F - Purge Ventilation ^(Note 1)	Option 1: Opening external window(s) meeting requirements described in Appendix B of Part F.	No specific acoustic criterion needs to be met in a room using purge ventilation for the purpose of rapidly diluting indoor pollutants.
	Option 2: Manually controlled fan extracting 4 air changes per hour.	

Note 1 - ADF has a clearly defined objective definition of purge ventilation to rapidly dilute pollutants and/or water vapour. This is defined as 4 air changes per hour in Appendix A of the Approved Document. This is used for occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water. Purge ventilation can also be used to improve thermal comfort. This is not controlled under the Building Regulations. Purge ventilation may form one part of a design strategy to control the risk of overheating. The level of ventilation required to control overheating will depend on the details of the individual room and dwelling and can be different than the 4 air changes per hour required to dilute pollutants/water vapour.